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Two-level systems driven by large-amplitude fields F. NORI, S. ASHHAB, J.R. JOHANSSON, RIKEN, Japan, and Univ. of Michigan, Ann Arbor. USA, A.M. ZAGOSKIN, RIKEN, Japan, and Loughborough Univ., UK — We analyze the dynamics of a two-level system subject to driving by large-amplitude external fields, focusing on the resonance properties in the case of driving around the region of avoided level crossing. In particular, we consider three main questions that characterize resonance dynamics: (1) the resonance condition, (2) the frequency of the resulting oscillations on resonance, and (3) the width of the resonance. We identify the regions of validity of different approximations. In a large region of the parameter space, we use a geometric picture in order to obtain both a simple understanding of the dynamics and quantitative results. The geometric approach is obtained by dividing the evolution into discrete time steps, with each time step described by either a phase shift on the basis states or a coherent mixing process corresponding to a Landau-Zener crossing. We compare the results of the geometric picture with those of a rotating wave approximation. We also comment briefly on the prospects of employing strong driving as a useful tool to manipulate two-level systems.

S. Ashhab, J.R. Johansson, A.M. Zagoskin, F. Nori, Two-level systems driven by large-amplitude fields, Phys. Rev. A 75, 063414 (2007). S. Ashhab et al, unpublished.

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